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Entrepreneurship and the Extensive Margin in Export Growth

A Microeconomic Accounting of Costa Rica's Export Growth during 1997–2007

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Abstract

The literature on the correlation between exports and economic development runs deep into the history of economic thought and permeates policy debates. This paper studies the microeconomic structure of export growth in Costa Rica, with special emphasis on the extensive margin of trade, encompassing new exporting firms, new products, and new export markets, as well as the unit values of new versus incumbent products. The data suggest that few new firms survive the test of exporting—more than 40 percent of firms exit export activities after one year—and this firm turnover is associated with a steady deterioration of export unit values (prices). Furthermore, most new export products are associated with product switching by incumbent exporting firms. The typical new product introduced by incumbent firms tended to be priced at about 90 percent of the unit values of incumbent products. In contrast, the usual suspected obstacles to export growth, such as the inability of small firms to enter exporting activities or to grow their exports, appear to be important sources of export growth. In fact, the smallest exporting firms experienced the fastest growth in their export values. Some of these results are compared with those from other countries that have been examined in related literature.

This paper—a product of the Office of the Chief Economist, Latin America and the Caribbean Region; and Trade and Integration Team, Development Research Group—is part of a larger effort in both departments to assess the role of the structure of trade in development. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at dlederman@worldbank.org.

Entrepreneurship and the Extensive Margin in Export Growth: A Microeconomic Accounting of Costa Rica's Export Growth during 1997-2007*

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I. Introduction

Successful exporting countries are often seen as successful economies. The academic literature on the relationship between export success and economic development dates back to the classical economists. More recently, the literature has ascertained that growth accelerations are associated with export expansions (e.g., Hausmann et al. 2005). The microeconomics literature on exporting and firm performance is similarly extensive, and recent literature emanating from Melitz's (2003) seminal paper on the role of firm-productivity heterogeneity and exporting decisions is already immense. And there is little doubt that exporting is in fact robustly correlated with a variety of intermediate indicators such as prices (unit values) set by exporting firms versus domestic firms. In a recent paper, for example, Hallak and Sivadasan (2009) find that in four countries (India, Chile, Colombia and the United States) exporting firms tend to sell products of higher quality at higher prices, pay higher wages and use capital more intensively than non-exporting firms.

The policy debates about trade and exports are no less thin than the academic literature. Most governments use export promotion policies and have established export promotion agencies, regardless of the level of development or institutional capacities (Lederman, Olarreaga and Payton 2010). The World Bank consistently argues that promoting trade and exports in particular is a recipe for promoting firm and national productivity (e.g., Fajnzylber, Guasch, and López 2009). In the case of Costa Rica, the government incorporated export targets into its National Economic Plan for 2006-2010, thus following in the footsteps of various East Asian economies that used export targets as a means of identifying successful firms in the 1970s and 1980s (Noland and Pack 2003, Pack 1997). Furthermore, export activities are also seen by policymakers as a means to improve the productivity or other outcomes of small and medium enterprises, and thus export promotion policies are often designed to serve these firms rather than large or multinational corporations (Volpe and Carballo 2008).

In this paper we study the role of entrepreneurship or the extensive margin of exports. This entails an examination of the microeconomic structure of Costa Rican export growth during 1997-2007. The empirical analyses rely on customs data compiled by the Costa Rican export promotion agency, PROCOMER. The data includes all firms that exported any good during this time period and provide information on export values,

quantities measured in kilograms, and destination markets. Although the information is limited, because it does not provide information about domestic sales or other variables that would be needed to calculated standard indicators of firm productivity, it does allow us to decompose export growth to enable analyses about the role of firm turnover in and out of exporting activities, and about the main drivers of export growth across firms of different export sizes (in terms of export value).

The main findings are as follows. First, the rate of firm turnover into and out of exporting activities is quite high, and this turnover is dominated by firms exporting lower volumes than incumbent firms. On average, about 30 percent of incumbent firms in each year tend to exit export activities while a similar percentage of firms enter. The exiting and entering firms tend to be significantly smaller than incumbent firms in terms of export value (e.g., entrants export about 30 percent of the average exports of incumbent firms). Over time, by the end of 1997-2007, the main driver of export growth in Costa Rica was the introduction of new products by incumbent firms. New product-firm combinations (i.e., product-firm combinations not present in 1997) account for almost 60 percent of the value of exports in 2007, but the contributions of new firms and new products separately explain no more than 8 percent of total exports. As in Eaton et al. (2007), export growth is negatively correlated with export value across firms – in particular, the smallest quintile of firms experienced the fastest growth rates of exports.[1] Hence the main obstacle to export growth does not seem to be an issue related to size, but rather the challenge seems to be the survival of firms in export activities. In fact, over 40 percent of firms exit exporting after one year, and the exit rate thereafter hovers around 20 percent.[2] Finally, the entry of new and incumbent firms into new products seems to be associated with reductions in the median real unit value of exports. In addition, and consistent with existing literature, the decline in median unit values seems associated with increases in the effect of distance on export outcomes across destinations. More specifically, the effect of distance on the value, the number of products, and to a lesser extent the average unit value of exports to each destination appears to have risen during the period of declining unit values. All this is borne

[1] See Arkolakis (2009) for an explanation of why small exporters experience faster growth.
[2] These numbers were calculated by the authors, based on data provided by PROCOMER and cleaned by the authors – see Section III below.

out in the estimation of the gravity models of trade first estimated with United States data by Bernard et al. (2007).

The rest of this paper is organized as follows. Section II briefly compares Costa Rica's export and GDP-per-capita growth performance during 1997-2007 with other countries and regions. Section III discusses the PROCOMER data by comparing the series with other data on Costa Rican exports. This section also describes how the firm data was cleaned and discusses key features of the resulting data set, including the lack of significant changes in the composition of exports and exporting firms across broad industrial categories. Section IV presents the microeconomic accounting frameworks used to assess the contribution of incumbent and new firms, products and export market destinations, as well as unit values to total export growth in the short run and in the long run. In addition, Section IV also briefly reviews the estimation equation of the gravity model of trade and relates it to the role of unit values in affecting the "costs" of distance to export markets. Section V concludes with a brief summary of the results.

II. Costa Rica's Export and Growth Performance in Comparative Perspective, 1997-2007

Table 1 shows average growth rates of exports (measured in current U.S. dollars) and gross domestic product per capita (adjusted for purchasing power parity with international prices of 2005) for the period 1997 – 2007.

Costa Rica's average export growth during this period was 9 percent per year. This rate was a bit higher than the average export growth rate for Latin America and the Caribbean region, clearly superior to Central America and the Caribbean, but lower than the average for other regions. Within Latin America, Costa Rica's export growth performance is dominated by Peru and Chile, which achieved export growth rates of 16.4% and 15.7% respectively.

The picture is slightly better when looking at GDP per capita growth rates. Costa Rica's economic growth rate of 3.3% was higher than Peru's and Chile's, and higher than the average for all regions except Europe and Central Asia and South Asia. This suggests that Costa Rica's overall economic performance was relatively more impressive than its export growth rate.

III. The PROCOMER Data

Before conducting a detailed analysis of the microeconomics of export growth, we need to ascertain the quality of the data. Figure 1 compares the value of total Costa Rican merchandise exports in the PROCOMER data with the World Bank's data on total merchandise exports, which come from official government sources, probably the Central Bank.

The two series are not identical, which could be worrisome, but is probably due to data manipulation by the Central Bank to conform to international balance of payments accounting practices. However, the over time correlation is very strong, and thus the PROCOMER data does capture the direction if not the exact magnitude of merchandise export growth observed in the macroeconomic data. The divergence between the two series is largest in 1997 and 1998, which converge to a constant gap in 1999. Consequently, the PROCOMER data tend to exaggerate the total export growth rates in 1998 and 1999, but the subsequent growth rates are comparable, as shown in the companion table to Figure 1. Nonetheless, the underlying microeconomic dynamics observed in the PROCOMER data are informative for understanding the sources of total export growth during this time period.

Unfortunately there are other issues with the PROCOMER data, which would affect the microeconomic analyses. Table 2 lists the steps taken to clean the data and the main features of the resulting data set.

The cleaning focused on issues that are relevant for understanding the microeconomic sources of export growth, including the role of incumbent, new and exiting firms, products and destinations, as well as unit values (the ratio of export value over quantities exported measured in kilograms). Hence we removed duplicate observations of firms-product-destinations, deleted observations where the description of the product was empty, entries where the reported quantity was zero, observations that reported Costa Rica as the destination market, etc. After this phase of the cleaning, the total number of observations of firms-products-year-destinations declined by about 6,000 observations and total export value declined by 0.26 percent. The next step was to remove any remaining duplicate observations that were due to the recording of the same firm, but with spelling mistakes or other errors in the reported name of the firm. This step reduced the total

number of firm-product-destination-year observations by about 800. Finally, given that we are interested in learning about Costa Rican firm dynamics in export activities, we received data from Procomer that excluded the observations corresponding to sets of products, namely infusion and transfusion equipment and electronic components for micro-processors. These products contributed a huge share to total merchandise exports during the sample period (over 26 percent of the total) and were dominated by the exports to a single firm in each sector.

Table 3 describes the main features of the resulting data set. Regarding export growth, the resulting data shows a weaker performance than the aggregate export data presented in Figure 1. The year 1998 remains an outlier with a real growth rate of 29 percent, even after excluding the aforementioned product categories.[3] This year was also an outlier in the aggregate export data. In the remaining years, the real export growth rates were rather mediocre when compared to the aggregate data, with negative real growth rates during the years of the East Asian financial crisis of 1997-1999, the beginning of the U.S. slowdown in 2000-2001, and the incorporation of China as a full member of the World Trade Organization in 2001. Thereafter the real export growth rates were positive but modest, except in 2006 when it reached 10 percent.

The most striking feature of the data, however, is the low number of firms that reported exports in every year during 1997-2007, which were 554. This is a mere 6.2 percent of the total number of firms that appear in the sample during the eleven years. The number of continuing products, measured either at the 6- or 10-digit product categories, is also small relative to the total number of products exported at any time during this period (27.6 and 15.5 percent, respectively). The difference between these ratios also indicates that the level of aggregation of the product categories affects the accounting of the contribution of the new products. In contrast, the number of export destinations was relatively constant over time, and over 46 percent of destinations were serviced every year. Overall, the cleaned data suggest that the rate of turnover of exporting firms and products is quite high, with very few continuing firms and products, the latter being sensitive to the product nomenclature.

[3] It is noteworthy that these excluded export products appeared in 1998.

Table 4 provides a standard analysis of the composition of trade. It shows the export shares of broad industrial sectors. If the aforementioned high turnover rates of firms and products were associated with structural change across industries, we should also observe dramatic changes in the composition of trade. The data in this regards is a bit noisy and needs to be analyzed with caution. The last industry, which is broadly labeled "services", captures over 13 percent of total exports at the beginning of the sample but falls to zero by 2001. Also, the industry labeled "Miscellaneous" experienced a dramatic increase in its share, but it is difficult to interpret these fluctuations in export shares as structural change precisely because these industries are loosely identified. Perhaps more interestingly, between 2001 (when "services" were more appropriately recorded as having a zero share in the merchandise export accounting) and 2007 the most dramatic decline was in textiles and apparel, an industry that we know had faced tough competition from Chinese exports to third markets, including the United States, as a result of its WTO accession and the dismantling of the Multi-Fiber Arrangement that had historically maintained high levels of protection for costly producers in high-income countries (see Ozden and Sharma 2006, and Ozden 2006).[4] In brief, the changes of the inter-industry structure of Costa Rican exports between 1997 and 2001 seems to be a recording illusion, due to the role of "miscellaneous" and "service" merchandise exports, and after the latter category disappeared in 2001, the only notable structural change is related to the textile and apparel sectors. More importantly, these structural changes are minute when compared to the evidence concerning the rather high rates of firm and product turnover rates during 1997-2007. Thus, most of the action in terms of firm and product dynamics was within sectors, rather than across broad industrial categories. This observation alone makes the fast growing literature on firm heterogeneity and within industry dynamics (e.g., Melitz 2003) of particular interest to the case of Costa Rica. In this light, the following sections assess the contribution of firm, product and export-destination dynamics to overall export growth.

[4] Ozden and Sharma (2006) found that preferential margins on apparel exports to the U.S. from beneficiaries of the Caribbean Basin Initiative declined significantly during 2000-2002 when compared to 1992-2000. Ozden (2006) found that Costa Rican apparel exports to the U.S. declined after 2000, but that average unit values (prices) of apparel exports to the United States rose.

IV. Accounting for Microeconomic Sources of Export Growth

To assess the contribution of microeconomic dynamics related to firm, product and export destinations, we conduct two sets of export-decomposition exercises. The first concerns the contribution of microeconomic dynamics to short-term growth, namely on annual growth rates during 1997-2007. There are fortunately existing comparable studies: one on Colombia (Eaton et al., 2008) and another on Chile (Alvarez and Fuentes, 2009). In addition, we discuss the export growth rates across the size-distribution of Costa Rican firms and explore the contribution of new firms, products and export destinations in the longer run, which is defined as the ten-year period of export growth. Finally, it is worth examining the evolution of export unit values (prices) to assess how microeconomic dynamics are affecting the "quality" of Costa Rican exports.

A. Short-run decomposition framework

The export-growth decomposition framework used by Eaton et al. (2007) to study export growth in Colombia is given by equation (1):

(1)

$$\frac{X_t - X_{t-1}}{\frac{1}{2}(X_{t-1}+X_t)} = \left(\frac{\frac{1}{2}(X_{t-1}^{CN}+X_t^{CN})}{\frac{1}{2}(X_{t-1}+X_t)} * \frac{X_t^{CN}-X_{t-1}^{CN}}{\frac{1}{2}(X_{t-1}^{CN}+X_t^{CN})}\right) + \left(\frac{NEN_{t-1}*\overline{X_{t-1}}}{\frac{1}{2}(X_{t-1}+X_t)} + \frac{X_t^{EN}-NEN_{t-1}\overline{X_{t-1}}}{\frac{1}{2}(X_{t-1}+X_t)}\right)$$
$$+\left(-\frac{NEX_{t-1}*\overline{X_{t-1}}}{\frac{1}{2}(X_{t-1}+X_t)} - \frac{X_{t-1}^{EX}-NEX_{t-1}\overline{X_{t-1}}}{\frac{1}{2}(X_{t-1}+X_t)}\right)$$

where X_t equals total exports in year t; $\overline{X}_{t-1}$ is the average exports (across firms) in year t-1; CN, EN and EX are indexes for variables corresponding to continuing, entering and exiting firms, respectively (continuing firms are those that exported both in t and t-1, entering firms are those that exported in t but not in t-1, and exiting firms are those that exported in t-1 but not in t); and NEN_t and NEX_t is the number of entering and exiting firms in t, respectively. The denominator in the export growth ratio is the average of exports in t and t-1, which Eaton et al. use for convenience so that the growth rates do not

depend on either year. In any case, the results discussed further below are not significantly affected by this choice of denominator.

In a nutshell, the decomposition exercise separates the contributions to annual export growth of incumbent, entering and exiting firms. The contribution of incumbent firms is simply the product of the share of exports of incumbent firms times their export growth. This contribution appears in the first term inside brackets in equation (1).

The contribution of entering firms has two components, both appearing inside the brackets of the second term on the right-hand side of (1). The first is simply the number of entering firms as a share of average number of total firms in t-1 and t. In (1), this is written as the number of entrants times the average exports per firm in t-1. The second component concerns the deviation of the average exports of entering firms from the average exports of incumbent firms, the latter being equal to the number of entering firms times the average exports per firm in the previous year. The calculation of the contribution of exiting firms is analogous to that of the contribution of entrants. The results from these decompositions of annual export growth rates are presented in the following section and Table 5.

As discussed below, it turns out that the annual growth rates are dominated by the contribution of incumbent firms. Thus, it is worthwhile to explore the contribution of new and exiting products and export destinations by incumbent firms. Tables 6 and 7 contain the results for these decomposition exercises.

B. Short-run results

The first column of Table 5 shows the annual growth rate of real exports observed in the cleaned PROCOMER data. The second column shows the share in total exports in the previous year due to incumbent firms, and the third column contains the export growth of these incumbent firms. The evidence clearly shows that incumbent firms dominate export growth from year to year, as over 95 percent of total exports in the previous year were due to firms that remained as exporters in the following year. Consequently the export growth rate of the incumbent firms closely tracks the annual growth of total exports.

Interestingly, the rate of turnover of exporting firms is large. The number of entrants is higher than 27 percent of the number of incumbent firms in every year – see column 4. Similarly, the rate of exit is higher than 25 percent every year – see column 6. Furthermore,

the average exports of entrants and departing firms tended to be low relative to the average export value of incumbent firms. This is reflected in the value gap of entrants and departing firms, which was around 30 percent during the period (i.e., entrants were 30% smaller than incumbents, and similarly for firms that stopped exporting). Thus incumbent firms' export growth dominates the total export growth in spite of the rather high turn-over rate of exporting firms, because the entrants and exiters export very low values.

The results on firm dynamics for Costa Rica seem high. However, the evidence from Colombia and Chile also suggest that firm turn-over in export activities tends to be high. For the case of Colombia, Eaton et al. (2007) report entry rates that average over 45 percent and the average exit rates surpass 43 percent per year during 1996-2005. Alvarez and Fuentes (2009) report comparable rates for Chilean manufacturing exports during 1991-2001 when annual entry rates averaged over 29 percent while exit rates ranged between 8 and 28 percent. Thus the results for Costa Rica in terms of firm dynamics seems consistent with data from other case studies.

The evidence on firm turnover in Costa Rica indicates that entry into exporting activities might not be a binding constraint for national export growth. What seems much more of an obstacle is firm survival in exporting activities. In fact, the data indicate that 43 percent of firms exit export activities after only one year, 29 percent of firms that survive the first year exit after the second year, and 25 percent of those that survive at least two years exit after the third year.

Regarding the role of new export destinations in shaping the growth of exports of incumbent firms, Table 6 shows the results from the decomposition of the annual export growth of incumbent firms into incumbent destinations, new destinations, and exiting destinations for exports. Incumbent destinations account for most of the observed export growth of incumbent firms.

Table 7 presents the results concerning the contribution of the new and exiting products exported by incumbent firms. The entry and departure rates of products exported by incumbent firms are very high, even higher than the firm and export-destination turn over-rates reported in tables 5 and 6. Also, the value gaps are larger for new and exiting products than for entering and exiting firms or destinations. Finally, the yearly shares of

total exports contributed by incumbent firm-product combinations, while still over 92 percent of total exports, are slightly lower on average than the share of incumbent firms.

In sum, in the short-run, the growth rate of exports by incumbent firms determines the aggregate export growth rate, but this occurs with vigorous firm dynamics. These dynamics are characterized by high firm entry and exit from export activities, experimentation by incumbent firms with new markets, and especially with experimentation with new products. The introduction of new products and the shedding of existing products by incumbent firms tend to be the largest source of renewal for Costa Rica's exports.

C. Export growth across the size distribution of exports per firm

In Costa Rica and many other countries, policymakers are concerned about the growth of small and medium enterprises for various reasons. Here we focus on export growth rates. We have already seen that firms that enter or exit export activities tend do so with export values that are significantly below the exports of incumbent firms, but these characteristics say little about the average export growth rate of small or medium sized firms.

Table 8 shows the average annual growth rates of exports by firms across the size distribution. Firms were ranked according to the value of their exports, which we use as a proxy for firm size. The sample was divided into quintiles by export value. Quintile 1 corresponds to the 20 percent of firms with the smallest export value in each year, and quintile 5 captures the largest 20 percent of firms in each year. The evidence suggests that small firms are actually the ones with the fastest growth rates on average. Indeed, export growth rates tend to decline with size, thus suggesting that size is perhaps not an impediment for export growth.[5]

D. Firm dynamics and export growth in the long run

The previously discussed results concern annual export growth rates. Given that incumbent firms dominate aggregate export growth in short run, but with notably high firm dynamics and especially firm-product dynamics, it is worth asking whether new firms, products, or destinations made significant contributions to Costa Rica's total exports between 1997 and

[5] Recall that these data exclude the largest multinational corporations operating in Costa Rica – INTEL and Abbott.

2007. In the long run we can expect much higher contributions to total exports from firm dynamics. In the case of Colombia, existing evidence indicates that the contribution of new firms to total export growth (of 7.6 percent) between 1996 and 2005 rose from 10 percent on an annual basis to 26 percent for the whole period (Eaton et al. 2007). The case of Chilean manufacturing exports is more dramatic: the contribution of entering firms to total export growth during 1991-2001 (which averaged 11.5 percent per year) rises from 23 percent on an annual basis to over 83 percent over the whole period (Alvarez and Fuentes 2009).

Table 9 provides calculations of the contribution of new firms, new products, and new combinations of firms and products, and new combinations of firms, products and destinations to Costa Rica's total exports during the period under examination. The first column shows the share of total exports that was contributed by firms that did not conduct export activities in 1997 and 1998. The second column shows the same ratio but for new products (that did not exist in the PROCOMER data in 1997 and 1998). The third column focuses on new firm-products and the fourth column on new firm-product destinations.

As expected the contribution of entry rises over time, as a byproduct of the large rates of turn over discussed in previous sections. By 2007, new firms accounted for about 5.6 percent of total exports, and new products for about 7.5 percent of the total. The big contribution came from the entry of new firm-product combinations, with a contribution of 59.6 percent by 2007. The addition of new destinations to new firm-product combinations only adds about 6.5 percentage points to the contribution of new firm-product combinations, thus accounting for about 66.1 percent of aggregate exports in the (cleaned) PROCOMER data. That is, while it is expected that adding new dimensions to the definition of "entry" will tend to increase its contribution to exports from an accounting perspective, it is the contribution of new firm-products that contributes the lion's share of exports.

Together with the previously mentioned evidence concerning the relatively high rates of product turnover among incumbent firms (recall Table 7), the evidence in Table 9 suggests that most of the action behind export growth in Costa Rica over the long run (or at least during 1997-2007) was due to product shifting by incumbent firms.

E. Firm dynamics, export unit values (prices) and distance to export markets

Having established some stylized facts about firm dynamics and export growth in Costa Rica, we now examine how export unit values, the ratio of export values in real dollars per kilogram of merchandise, evolved as a consequence of firm and product dynamics. The relevant calculations are presented in Table 10.

For each year in the sample, Table 10 presents the number of new firm-product combinations (FPs), the number of incumbent (i.e., that existed in the previous year) firm-product combinations, as well as the ratio of unit values of entrants over incumbents.[6] Ratio 1 is the mean unit value of entrants over the average unit value of incumbents; ratio 2 is the median unit value of entrants over the median unit value of incumbents. For each unit value ratio, Table 10 presents the average ratio for each year as well as the median ratio, the latter being less sensitive to outliers.

The data on the number of new and incumbent firm-product combinations confirm our previous conclusion that there was a very high rate of renewal of firm-products. Indeed, the number of new FPs exceeds the number of incumbent FPs in every year. Regarding unit value ratios, however, the data need to be interpreted with caution. The mean ratios would suggest that new FPs tended to export at higher unit values on average than incumbent FPs. The median ratios, in contrast, suggest that the typical new FP exported at unit values that were lower than those of incumbent FPs. Because new FPs tended to dominate Costa Rican exports in the long run (i.e., by 2007 since 1997), the fact that the typical new FP tended to export products at lower unit values than incumbent FPs should manifest itself in a downward trend in the overall median unit value of Costa Rican exports. This is, indeed, what happened – see Figure 2 – although this finding and graph need to be interpreted carefully but literally as the median unit value in dollars per kilogram derived from a sample of qualitatively vastly different products.

However, we should note that the facts discussed above do not mean that new FPs entered at unit values that were below the median (or average) unit value of incumbent firms that exported the same product (at the 10-digit level of the Harmonized System). In fact, rough estimations of the evolution of the relative unit value of new FPs over the

[6] Recall that the PROCOMER data measures the quantum of exports in kilograms for all products.

median unit value in a given product category suggest that this ratio was relatively constant over time. Rather, the deterioration of the median unit value of total Costa Rican exports was due to new FPs moving into products (within broad industrial categories, as discussed earlier) with lower median unit values.[7]

Furthermore, if unit values are declining and iceberg transport costs affect exports, then it is possible that the marginal effects of geographic distance to export markets became a tougher constraint on exports.[8] In their study of U.S. data, Bernard et al. (2007) argued that the distribution of products, exports values, and unit values should vary across destinations depending on distance if transport costs are relevant. To assess this hypothesis, we estimated the gravity-model equations presented by Bernard et al. (2007, Table 6), where the authors estimate the marginal effects of distance from the United States on its total export value, the number of exporting firms, the number of exported products, and export value per product per firm. This model can be written as:

(2) $\text{Log}(X)_i = \alpha + \beta*\text{Log}(GDP)_i + \gamma_t*\text{Log}(\text{Distance from Costa Rica})_i + \varepsilon_i,$

where i indexes Costa Rica's trading partners (export destinations), t indexes the years, GDP is the Gross Domestic Product (PPP adjusted from the World Bank's World Development Indicators database, base year of 2005), and Distance is the number of kilometers between San José, the Capital of Costa Rica, and the capital cities of its trading partners. The data for the latter variable comes from the French Research Center on International Economics (CEPII).[9] X denotes any of the aforementioned dependent variables. The coefficient of interest is γ, which is allowed to vary over time during 1997-2007.

For the case of the United States in 2000, Bernard et al. (2007) estimated the following coefficients γ: -1.36 for the total export value, -1.14 for the number of exporting firms, -1.06 for the number of exported products, and +0.84 for the export value per product per firm. The first three coefficients indicate that distance tends to reduce the value

[7] Results from regressions of the log of the ratio of new FP unit values over median unit values in the same HS10 product category as a function of year dummies are available upon request.
[8] More intuitively, Hummels (2007, p. 136) explains that "Ad-valorem transportation costs for a particular product depend on how far the good is shipped, the quality of the transport service offered, and the weight/value ratio of the good. Because all three factors vary considerably across shipments, transportation costs significantly alter relative prices and patterns of trade."
[9] http://www.cepii.fr/anglaisgraph/bdd/distances.htm)

of total exports, the number of exporting firms and the number of exported products to a given destination. The positive coefficient for the last regression suggests that large firm-product combinations are the ones that firms tend to export to the farthest markets.

For Costa Rica during 1997-2007, we are interested in knowing, first whether the coefficients on the distance variable are similar in magnitude to the ones estimated by Bernard et al. (2007) for the United States, and second whether the observed deterioration of median unit values associated with its firm-product dynamics has tended to increase the absolute value of the corresponding coefficients over time. Hence we estimated equation (2) for each one of the four dependent variables for every year during 1997-2007 for which all the data is available. If products with lower unit values tend to affect export outcomes by raising the (unobserved) ad-valorem equivalent of transporting merchandise, then we should observe increases in the absolute value of the estimated γ's.

Figures 3a-d show the evolution of the estimated parameters for each year. The graphs also show the 95 percent confidence interval. The evidence does show symptoms that distance was becoming more restrictive for export outcomes during the period under investigation. Furthermore, the (absolute) magnitude of the coefficients was larger for Costa Rica than the United States. For the total value of exports by destination, the coefficient on distance varies from close to -2.4 in 1997 to less than -2.9 in 2006, with a notable downward trend as there were only three years when the coefficient estimate rose. This range is well below the estimate for the United States of -1.36.

The effect of distance on the number of exporting firms per destination was persistently around -1.65 with no obvious trend. Again, however, this estimate is well below the estimate for the United States.

The effect of distance on the number of exported products, the variable where the decline in unit values associated with Costa Rica's firm-product dynamics should be most apparent, shows a negative trend throughout the period, and the point estimate varies from about -1.75 to less than -1.9. These estimates are significantly below the corresponding estimates for the United States.

The estimated distance coefficient for the model on the export value per firm per product shows a decline only during 2004-2006, although we expected this coefficient to

rise due to the decline in unit values as distance could have become more constraining for smaller firms. It is also noteworthy that the estimates of the distance coefficients in this model is strikingly similar to the coefficient for the United States discussed above (compare 0.84 for the United States with the estimates reported in Figure 3d with an average of 0.94).

These results should be interpreted with caution, partly because the over-time changes in the estimates do not seem to be statistically significant as the lowest (highest) estimates lie largely within the 95 confidence interval of the highest (lowest) estimates for all four estimated models. Nonetheless, the evidence does suggest that declining unit values could have affected the geographic distribution of Costa Rican exports. As the effect of distance got stronger over time, the number of exported products to far away markets tended to decline. However, there is little evidence that over-time changes in the effect of distance affected smaller firms more than larger firms. Moreover, the distance coefficient for this variable is the only one that is not significantly different from the corresponding parameter for the United States. Thus there is evidence that distance has a larger marginal effect on Costa Rican exports and the number of products exported than for the United States, and that this effect might have become more binding over time.

V. Summary

The main empirical findings of this study can be summarized as follows. Costa Rica's export performance was primarily limited by the inability of firms to survive the test of exporting – over 40 percent of firms exited export activities after just one year – and by a steady deterioration of export unit values (prices) that was associated with product switching by incumbent exporting firms. The typical new product introduced by incumbent firms tended to be priced at about 90 percent of the unit values of incumbent products. In contrast, the usual suspected obstacles to export growth, such as the inability of small firms to enter exporting activities or to grow their exports, are probably not the current binding constraints. In fact, the smallest exporting firms experienced the fastest growth in their export values. Overall, however, Costa Rica's export growth was not stellar when compared to other countries, and even less so without the contributions of two large multinational corporations.

Furthermore, inter-sectoral adjustments across broad industries were negligible, both in terms of export-value shares and in terms of the number of exporting firms as a share of the total number of exporting firms. Hence most of the action seems to be in within-industry dynamics. In the short run, export growth was due to the exports of existing and relatively large firms, but smaller firms underlie high rates of firm turn over into and out of exporting activities. This incumbent-export dominance was accompanied by high firm and product turnover rates. As a result, by 2007 almost 60 percent of Costa Rican exports were due to incumbent firms exporting products that were not originally exported in 1997. The long-term contribution of new firms and new products separately was small, totaling less than 8 percent of total exports in 2007. Moreover, small firms experienced much higher growth rates of exports than larger firms (excluding the two large MNCs). Finally, product turnover was associated with declining unit values and increases in the marginal costs of distance to export markets.

The long and short of export growth in Costa Rica since 1997 is a story about rich firm dynamics, whereby firms readily enter and exit exporting activities and the exports of the smallest exporting firms grow relatively fast. The main challenges might be firm survival in exporting activities and a steady deterioration in the typical unit value of exported products, which might imply that international trade costs will become ever more important in shaping the geographic pattern of Costa Rica's exports.

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Table 1. Annual Merchandise Export and GDP per Capita Growth Rates, 1997-2007

Country/Groups	Exports		GDP per Capital (PPP)	
	Mean	Median	Mean	Median
Costa Rica (1)	0.090	0.129	0.033	0.042
Export Over Achievers				
Peru (2)	0.164	0.160	0.028	0.033
Chile (2)	0.157	0.147	0.026	0.030
China (3)	0.215	0.215	0.088	0.088
Cambodia (3)	0.200	0.173	0.073	0.074
Azerbaijan (4)	0.317	0.361	0.140	0.100
Albania (4)	0.253	0.266	0.065	0.055
Libya (5)	0.210	0.230	0.016	0.026
Lebanon (5)	0.198	0.168	0.013	0.012
Buthan (6)	0.199	0.127	0.061	0.045
India (6)	0.158	0.193	0.055	0.062
Chad(7)	0.520	0.058	0.046	0.039
Sierra Leone (7)	0.447	0.480	0.043	0.039
Slovak Republic (8)	0.207	0.154	0.048	0.041
Czech Republic (8)	0.190	0.156	0.035	0.037
Equatorial Guinea (9)	0.374	0.422	0.190	0.143
Trinidad and Tobago (9)	0.215	0.236	0.076	0.074
Kazakhstan (10)	0.240	0.243	0.080	0.089
Lybia (10)	0.210	0.230	0.016	0.026
Sudan (11)	0.340	0.291	0.045	0.040
Azerbaijan (11)	0.317	0.361	0.140	0.100
Chad (12)	0.520	0.058	0.046	0.039
Sierra Leone (12)	0.447	0.480	0.043	0.039
Other Comparator Countries				
Singapore	0.100	0.129	0.034	0.040
Ireland	0.087	0.078	0.047	0.037
Hong Kong	0.067	0.090	0.032	0.040
Regional and Income Groups				
Latin America and Caribbean	0.084	0.083	0.020	0.019
Central America and Caribbean (1)	0.055	0.051	0.022	0.023
Latin America (2)	0.114	0.123	0.017	0.014
East Asia and Pacific (3)	0.097	0.088	0.026	0.020
Europe and Central Asia (4)	0.168	0.171	0.062	0.060
Middle East and North Africa (5)	0.163	0.162	0.023	0.026
South Asia (6)	0.126	0.104	0.042	0.042
Sub-Saharan Africa (7)	0.121	0.094	0.017	0.016
High income OECD members (8)	0.097	0.087	0.026	0.023
High income non OECD economies (9)	0.112	0.095	0.035	0.025
Upper-middle income economies (10)	0.105	0.093	0.034	0.030
Lower-middle income economies (11)	0.135	0.114	0.035	0.026
Low income economies (12)	0.119	0.094	0.017	0.018

Note: This table presents mean and median annual growth rates of merchandise exports (current US$) and GDP per capita PPP (constant 2005 international $) for each of the described groups. The regional and income country classifications come from the World Bank (as of July 2008). Each country's group is indicated inside parentheses. Highlighted cells indicate cases where the corresponding mean or median growth rate was below Costa Rica's. All data are from the World Bank's World Development Indicators.

Table 2. Cleaning the PROCOMER Data

Step	# of observations	Total real export value (1997 U.S.$)	% of initial value
Raw data	***296,238***	***59,219,688,885***	***100%***
(-) Duplicate entries	*10*	*174,453*	*0.00%*
(-) Entries with product description=""	*56*	*3,584,951*	*0.01%*
(-) Entries with quantity 0	*4,739*	*3,638,070*	*0.01%*
(-) country: Costa Rica	*217*	*2,144,049*	*0.00%*
(-) country: Alta Mar	*4*	*44,239*	*0.00%*
(-) country: Generico	*189*	*4,821,894*	*0.01%*
(-) country: Zonas Francas de Exportacion	*678*	*148,249,409*	*0.25%*
Subtotal	*290,345*	*59,057,031,820*	*99.73%*
Cleaning firm-product-year-country observations (consolidation of observations with similar firm names)	*289,549*	*59,057,031,820*	*99.73%*
(-) Exports of infusion and transfusion equipment (product-destination-years)	*1,157*	*1,816,626,930*	*3.07%*
(-) Exports of electronic components for micro-processors (product-destination-years)	*3,277*	*13,689,799,703*	*23.12%*
Cleaned data	***285,115***	***43,550,605,188***	***73.54%***

Source: Authors' calculations based on data from PROCOMER.

Table 3. Summary of the Cleaned PROCOMER Data: Real Export Growth, Firms, Products, and Destinations

Year	Total exports (1997 USD)	% Growth	Firms	HS6 products	HS10 products	Destinations
1997	3,217,752,622	-	2,200	2,454	3,283	121
1998	4,157,732,964	29%	2,328	2,629	3,513	129
1999	3,911,376,028	-6%	2,432	2,599	3,505	116
2000	3,695,897,353	-6%	2,392	2,594	3,557	121
2001	3,573,232,631	-3%	2,493	2,626	3,641	127
2002	3,827,746,595	7%	2,531	2,592	3,707	129
2003	3,860,064,635	1%	2,670	2,736	3,869	133
2004	4,055,665,596	5%	2,760	2,774	3,915	134
2005	4,083,061,065	1%	2,863	2,800	3,933	138
2006	4,507,923,206	10%	2,937	2,833	4,087	136
2007	4,660,152,494	3%	2,973	2,878	4,293	151
1997-2007 (total)			8,865	4,568	7,941	189
1997-2007 (continuing)			554	1,262	1,232	88
Continuing/Unique			6.2%	27.6%	15.5%	46.6%

Source: Authors' calculations based on data from PROCOMER and World Bank. Export growth is expressed in constant U.S. dollars of 1997, using the U.S. Producer Price Index as deflator.

Table 4. Broad Inter-Sectoral Changes are Absent

A. Sectoral Shares in Total Exports

Ind	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	10.3%	8.6%	4.4%	4.2%	4.4%	4.1%	4.0%	3.4%	3.6%	3.0%	3.0%
2	33.1%	29.9%	31.0%	27.0%	26.9%	25.5%	27.9%	27.0%	26.1%	26.7%	27.9%
3	8.5%	8.2%	8.7%	9.0%	9.4%	10.2%	10.1%	11.2%	11.0%	11.6%	13.5%
4	0.8%	0.7%	0.8%	1.5%	1.4%	1.6%	0.9%	0.3%	1.0%	0.9%	1.0%
5	5.1%	5.0%	5.8%	6.6%	7.7%	7.9%	8.5%	8.5%	8.2%	7.8%	8.1%
6	3.7%	3.2%	4.0%	4.5%	4.9%	5.2%	5.5%	6.0%	6.6%	6.5%	6.0%
7	1.1%	1.4%	1.5%	1.2%	1.2%	1.0%	1.2%	1.8%	1.7%	1.4%	1.1%
8	3.0%	2.7%	3.0%	2.9%	3.0%	2.9%	2.6%	3.3%	3.3%	3.4%	3.7%
9	6.0%	16.7%	18.0%	19.1%	18.0%	17.4%	13.9%	11.7%	10.4%	8.1%	6.8%
10	0.5%	0.5%	0.4%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	2.0%	2.5%	2.6%	2.2%	2.5%	2.7%	2.3%	2.1%	2.4%	2.9%	2.5%
12	2.8%	2.6%	2.8%	3.0%	3.0%	3.0%	3.1%	3.7%	4.2%	4.9%	5.7%
13	8.0%	10.8%	9.6%	12.4%	11.5%	12.6%	13.1%	14.2%	13.6%	14.6%	11.4%
14	0.2%	0.3%	0.4%	0.8%	0.9%	0.5%	0.7%	0.4%	0.5%	0.5%	0.7%
15	1.6%	3.7%	4.0%	4.1%	5.1%	5.4%	6.0%	6.5%	7.3%	7.6%	8.8%
16	13.2%	3.1%	2.9%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

B. Sectoral Share in Total Firms

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	6.9%	6.9%	6.5%	5.6%	6.3%	6.0%	6.1%	5.5%	5.0%	4.9%	4.4%
2	28.5%	27.1%	27.4%	29.8%	30.7%	29.1%	28.2%	27.6%	26.1%	28.1%	28.8%
3	9.2%	9.8%	10.1%	10.6%	10.4%	9.8%	9.8%	10.5%	10.5%	10.7%	10.3%
4	3.6%	4.7%	4.1%	4.0%	3.7%	3.7%	3.6%	3.8%	3.7%	3.8%	3.6%
5	14.1%	15.0%	15.2%	16.0%	16.3%	16.8%	16.6%	16.7%	16.6%	16.7%	16.4%
6	15.2%	18.1%	18.5%	19.1%	18.7%	18.4%	19.4%	20.2%	21.2%	21.6%	21.6%
7	3.0%	3.4%	3.2%	3.4%	3.6%	3.2%	3.9%	4.1%	3.9%	3.6%	3.5%
8	18.8%	19.7%	20.1%	19.9%	20.8%	20.4%	21.1%	21.2%	22.2%	20.4%	20.8%
9	11.1%	11.4%	12.3%	12.3%	11.4%	9.9%	10.0%	10.6%	10.3%	9.1%	9.5%
10	2.9%	3.0%	2.7%	2.9%	2.5%	3.0%	3.5%	3.4%	3.1%	3.2%	3.5%
11	6.2%	6.8%	6.5%	5.8%	5.9%	6.3%	7.0%	6.7%	7.4%	7.3%	6.6%
12	15.1%	16.4%	16.4%	15.7%	16.6%	16.7%	16.9%	17.8%	18.1%	19.1%	18.2%
13	22.4%	25.3%	26.1%	26.2%	25.8%	26.6%	26.9%	26.7%	28.2%	28.4%	27.8%
14	3.6%	5.2%	4.2%	4.6%	4.9%	5.1%	4.2%	5.0%	4.8%	5.3%	5.4%
15	14.5%	17.1%	17.6%	18.3%	18.6%	20.0%	18.4%	19.0%	20.8%	20.0%	18.8%
16	9.5%	5.8%	2.5%	2.3%	0.6%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%

Source: Authors' calculations based on data from PROCOMER. Ind = industry. See industry classification in the Appendix.

Table 5. The Contribution of Firm Turn Over in the Short Run

	Export growth	Share cont. firms	Growth cont. firms	Entry	Entry value gap	Exit	Exit value gap
1998	25%	97%	**26%**	30%	-27%	-25%	23%
1999	-6%	95%	**-7%**	35%	-30%	-31%	26%
2000	-6%	96%	**-4%**	30%	-28%	-32%	27%
2001	-3%	97%	**-5%**	34%	-31%	-30%	28%
2002	7%	98%	**7%**	30%	-28%	-29%	27%
2003	1%	98%	**1%**	34%	-32%	-29%	26%
2004	5%	98%	**7%**	32%	-30%	-28%	25%
2005	1%	99%	**1%**	33%	-31%	-29%	28%
2006	10%	98%	**11%**	29%	-27%	-27%	24%
2007	3%	99%	**3%**	27%	-26%	-25%	24%

Source: Authors' calculations based on data from PROCOMER. Cont.= continuing or incumbent firms.

Table 6. The Contribution of Destination Turn Over among Incumbent Firms in the Short Run

	Growth cont. firms	Share cont. firm_dest	Growth cont. firm-dest	Entry	Entry value gap	Exit	Exit value gap
1998	**26%**	96%	25%	28%	-23%	-23%	20%
1999	**-7%**	95%	-5%	27%	-24%	-30%	24%
2000	**-4%**	97%	-4%	28%	-26%	-26%	23%
2001	**-5%**	97%	-4%	26%	-23%	-27%	24%
2002	**7%**	96%	8%	25%	-22%	-26%	22%
2003	**1%**	98%	1%	27%	-25%	-24%	22%
2004	**7%**	98%	7%	26%	-24%	-24%	22%
2005	**1%**	97%	-1%	28%	-25%	-25%	23%
2006	**11%**	98%	10%	26%	-23%	-24%	22%
2007	**3%**	97%	4%	28%	-25%	-24%	20%

Source: Authors' calculations based on data from PROCOMER.

Table 7. The Contribution of Product Turn Over among Incumbent Firms in the Short Run

	Growth cont. firms	Share cont. firm_prod	Growth cont. firm_prod	Entry	Entry value gap	Exit	Exit value gap
1998	**26%**	94%	30%	50%	-45%	-41%	34%
1999	**-7%**	94%	-1%	52%	-49%	-51%	42%
2000	**-4%**	97%	-4%	54%	-51%	-49%	46%
2001	**-5%**	96%	-7%	53%	-48%	-49%	46%
2002	**7%**	96%	6%	46%	-41%	-45%	41%
2003	**1%**	96%	5%	53%	-50%	-46%	40%
2004	**7%**	96%	6%	48%	-44%	-46%	43%
2005	**1%**	98%	0%	50%	-48%	-46%	45%
2006	**11%**	98%	10%	48%	-46%	-44%	42%
2007	**3%**	92%	2%	51%	-43%	-48%	41%

Source: Authors' calculations based on data from PROCOMER.

Table 8. Export Growth Rates across the Size Distribution of Firms – Gibrat's Law Does Not Hold

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Q1	709%	6637%	909%	4533%	1041%	2003%	1253%	1634%	755%	809%
Q2	273%	547%	428%	343%	196%	167%	210%	380%	311%	217%
Q3	123%	119%	156%	112%	40%	59%	45%	107%	53%	85%
Q4	51%	29%	24%	73%	17%	11%	27%	50%	26%	23%
Q5	28%	-10%	-6%	-9%	6%	0%	7%	-2%	10%	2%

Source: Authors' calculations based on data from PROCOMER.

Table 9. The Contribution of New Firms, Products and Destinations in the Long Run as a Share of Total Exports

Year	New Firms	New Products	New Product-Firms	New Product-Firm-Destinations
1998	0.000	0.000	0.000	0.000
1999	0.002	0.005	0.083	0.121
2000	0.003	0.007	0.184	0.234
2001	0.004	0.008	0.259	0.317
2002	0.009	0.018	0.360	0.434
2003	0.032	0.040	0.462	0.531
2004	0.027	0.042	0.529	0.587
2005	0.036	0.051	0.558	0.613
2006	0.030	0.056	0.556	0.622
2007	0.056	0.075	0.596	0.661

Note: New firms, products, destinations are those that did not exist in 1997 AND 1998.
Source: Authors' calculations based on data from PROCOMER.

Table 10. Firm-Product (FP) Turn Over and Unit Values

Year	Number of Entrant FPs	Number of Incumbent FPs	Ratio 1: UV of Entrants/(mean UV of Incumbents)		Ratio 2: UV of Entrants/(median UV of Incumbents)	
			Mean Ratio	Median Ratio	Mean Ratio	Median Ratio
1997	11,391	n.a.	n.a.	n.a.	n.a.	n.a.
1998	8,158	5,142	256.53	0.72	257.28	0.90
1999	8,294	5,575	4.23	0.69	5.00	0.87
2000	8,094	5,761	6.96	0.72	8.39	0.88
2001	8,491	5,839	6.36	0.73	7.51	0.91
2002	8,252	6,333	12.21	0.66	13.14	0.86
2003	9,434	6,452	5.27	0.61	6.93	0.84
2004	9,299	7,023	6.78	0.66	8.02	0.90
2005	9,735	7,466	13.88	0.61	15.03	0.84
2006	10,473	7,738	4.64	0.59	7.29	0.85
2007	10,880	7,714	5.01	0.65	6.59	0.89

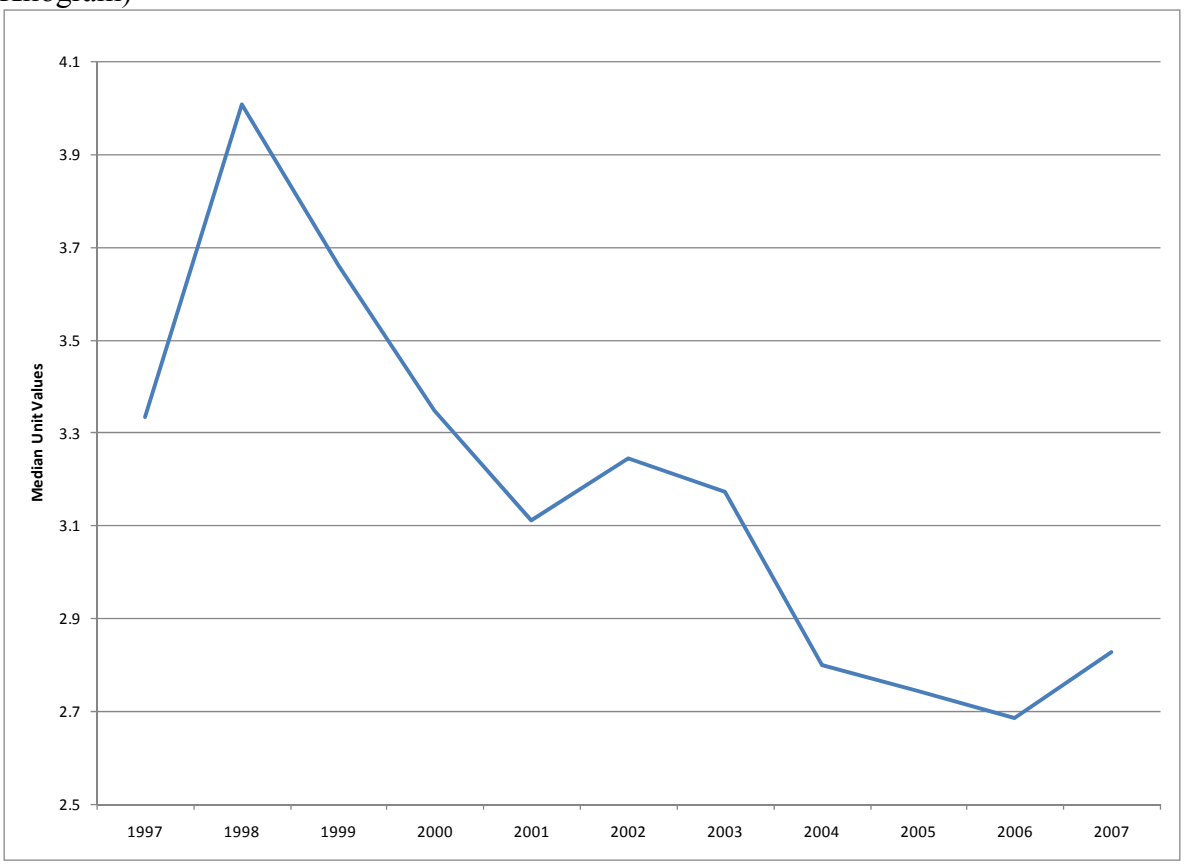
Note: n.a. = Not applicable. FPs = Firm-product combinations.
Source: Authors' calculations based on data from PROCOMER.

Figure 1. Costa Rica: Merchandise Exports versus PROCOMER Data, 1997-2007

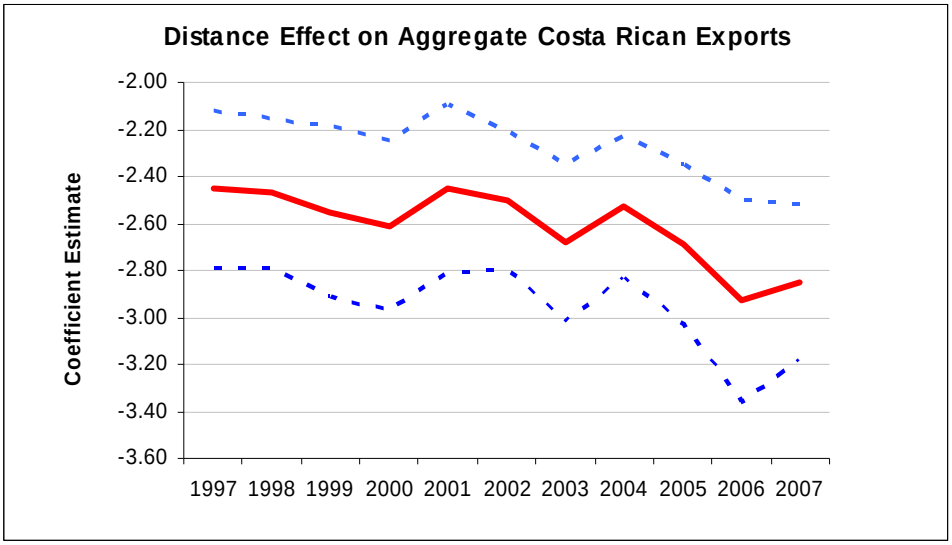
Source: Data are from PROCOMER and World Bank, and both series are expressed in current U.S. dollars. The resulting merchandise export growth rates appear in the table below.

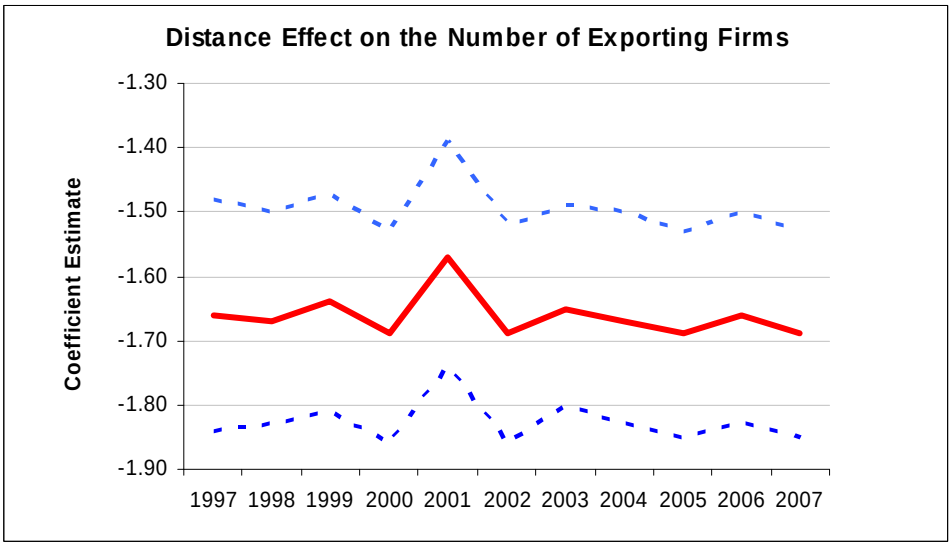
	Procomer Export Growth	Export Growth WDI
1998	56.8%	29.1%
1999	26.7%	19.3%
2000	-12.1%	-10.8%
2001	-13.6%	-14.4%
2002	5.0%	4.8%
2003	15.6%	15.9%
2004	2.5%	3.3%
2005	11.4%	11.5%
2006	17.8%	16.7%
2007	13.9%	14.2%

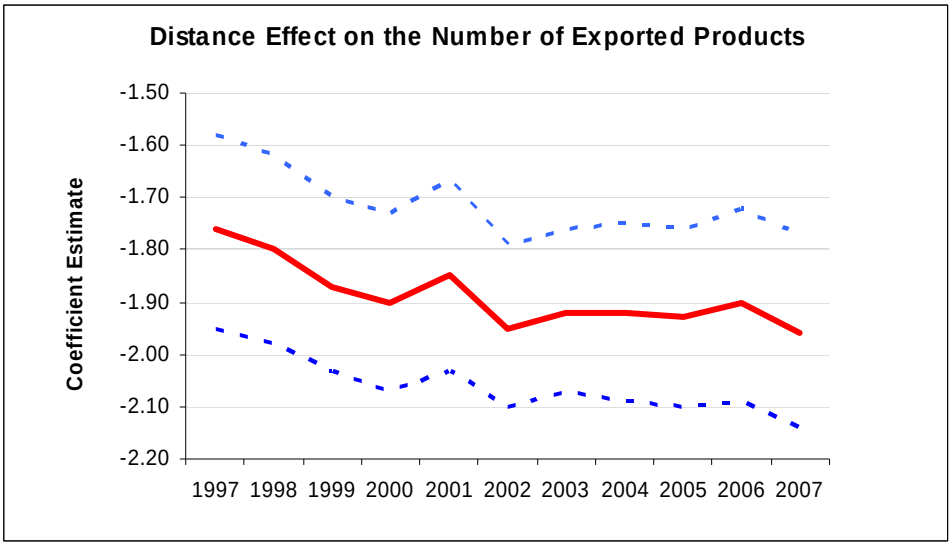
Figure 2. Median Unit Values of Costa Rican Exports, 1997-2007 (U.S. dollars of 2005 per Kilogram)

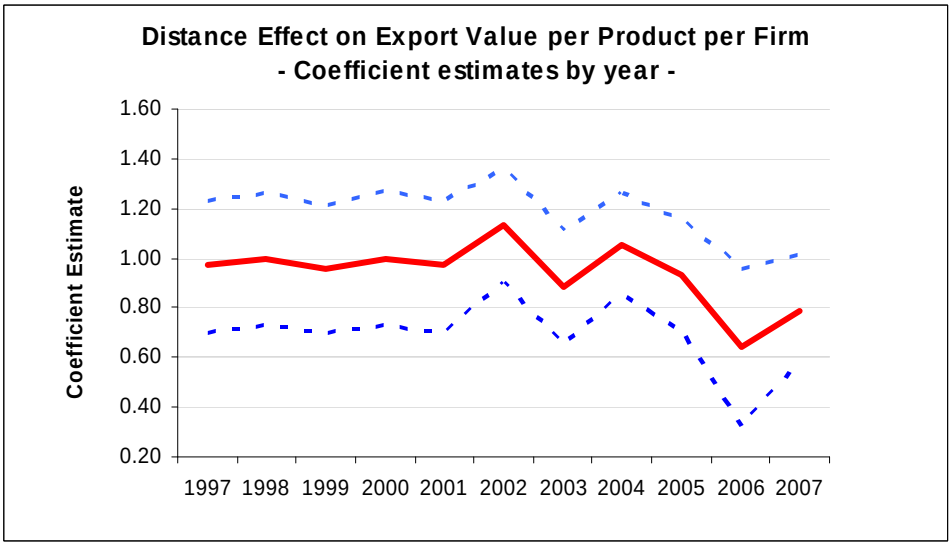


Figures 3a-d. Estimated Effects of Distance to Markets on Total Exports, Number of Exporters, Number of Exported Products, and the Value of Exports per Product per Exporting Firm since 1997









Source: Authors' calculations based on data from PROCOMER, World Bank, and http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

Appendix

Table A1. Broad Industrial HS Classification Used in Table 4.

1	Animal and Animal Products
2	Vegetable Products
3	Food stuffs
4	Mineral Products
5	Chemicals and Allied Industries
6	Plastics / Rubbers
7	Raw Hides, Skins, Leather, and Furs
8	Wood and Wood Products
9	Textiles / Apparel
10	Footwear / Headgear
11	Stone / Glass
12	Metals
13	Machinery / Electrical
14	Transportation
15	Miscellaneous
16	Service